

Economic Competition, Sustainability, and Survival Endurance: The Extinction of the Dodo, the Easter Island Case, and the Tragedy of the Commons Effect

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Abstract: A fast developing industry worldwide, tourism demands a monumental extent of resources, and at times devastates and condemns the very own environments that are fundamental to the economic survival of organizations and the sustainability of travel destinations. The purpose of the study is to link three established scientific themes on survival and sustainability to empirical results in the field of economic decision and behavior. The discussion of this link may also represent the originality value of the paper. Departing from the results of a series of decision games obtained under a quasi-experimental design, behavioral patterns were analyzed and extrapolated to explore the terminal effects of competition trends on the survival and economic viability of organizations and travel destinations in restricted environments. The findings show that the identified competition tendency neutralized an important share of the economic potential offered by the decision game, with significant negative effects on the economic efficiency. If persistent, the competition tendency is expected to produce long term effects on the sustainability and economic survival of organizations and travel destinations in restricted environments.

Keywords: Economic competition, sustainability, economic survival endurance, restricted environments, travel destinations

Introduction

The travel and tourism industry, and specifically the business tourism operations related to meetings, incentives, conferences, and exhibitions (MICE), are frequently considered strategic vectors in the development of cities as travel destinations, though frequently colliding with sustainability concerns, concerns that are even more justified when organizations and travel destinations operate in restricted environments.

Restricted environments are defined as environments characterized by conditions that generate especial vulnerability to extreme competition and to collapses caused by the depletion of resources. These are environments with inherently unstable equilibriums and higher risks to the economic survival of organizations, and in the limit to the economic survival of a whole city as a travel destination.

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Suggested citation: Moreira, P. (2012). Economic competition, sustainability, and survival endurance: The extinction of the dodo, the Easter Island case, and the tragedy of the commons effect. *Higher Learning Research Communications*, 2(4), 23-36. <http://dx.doi.org/10.18870/hlrc.v2i4.84>

The study's main research question focuses on the dominant tendency or behavioral pattern found in a decision game with competition versus cooperation alternatives, and on the implications of that dominant tendency to economic efficiency, sustainability, and survival endurance. The purpose of the paper is to present a summary of relevant theories and cases on competition, survival, and sustainability, and to discuss the implications of the research findings on the economic survival endurance of travel destinations in restricted environments.

The first section includes a review of the literature and the presentation of three established scientific themes on survival and sustainability: the extinction of the Dodo; the Easter Island case; and the tragedy of the commons effect. The next sections describe the methodology and the results and data analysis. The last two sections include a discussion of the results and of the themes presented, followed by the conclusions and implications of the study.

Organizational Ecology, Restricted Environments, Systems Overload, and Systems Collapse

It remains to be studied how the interaction of dispersal, local adaptation, and plasticity determines the demography and evolution of a species across space, when the environment also changes in time. (Chevin & Lande, 2009, p. 1149)

Time, the denominator of economic value, eventually renders all advantages obsolete. (Williams, 1992, p. 29)

A fast developing industry worldwide, tourism demands a monumental extent of resources, and at times devastates and condemns the very own environments that are fundamental to the sustainability of destinations and the economic survival of organizations. Business tourism operations related to meetings, incentives, conferences, and exhibitions (MICE) are frequently considered strategic vectors in the development of cities as travel destinations, and frequently collide with sustainability concerns. Business events are concentrated in time with a very intense demand for resources in a minimal period, and create conditions that may lead to systems overload and, in the limit, to systems collapse. In this paper, system overload is understood as the submission of a system to demands that exceed the limits of adaptation. System collapse, in the sense of human or organizational populations, is defined as a drastic decline in the population figures which stabilize far down from the highest levels reached in the past.

Butler (2010, 1980) focused on the parallels between the concepts of tourism area life cycle, sustainable development, and carrying capacity to discuss the risk of exceeding development limits and the importance of reaching a state of sustainability. The first argument on the difficulty of achieving this state of sustainability is the absence of knowledge and control over destination limits, tourist flows, and industry development and operation that exists in most destinations. According to Butler (2010, 1980), both the concept of tourism area life cycle and the concept of sustainability demand for stabilization or growth stop on approach to the carrying capacity limits. Exploring more specific elements, Liu (2003) distinguished five dimensions of carrying capacity: (1) physical, related to the maximum number of visitors; (2) ecological, related to the effects on the environment and on the sustainability of the natural resources; (3)

psychological, involving the perceptions of tourists; (4) social, including the sociocultural impacts; and (5) economic, linked to financial performance and development opportunity costs. Clarke (1997) identified four approaches to sustainable tourism: (1) sustainable tourism versus mass tourism, opposing a small and sustainable scale against a large and unsustainable scale; (2) continuum between sustainable tourism and mass tourism, refuting a fundamental difference; (3) sustainability as the real focus instead of scale, with the argument that mass tourism could be sustainable; and (4) convergence of the scale extremes with sustainable tourism to be applied to all scales of development. In our view, Clarke's four approaches can also be considered as a stages sequence, and we suggest that this idea could be investigated through historical studies over the past routes and characteristics of development on destinations that reached already a wide and mature range of sustainable travel and tourism operations.

The literature includes some degree of criticism about the state and the direction of the theoretical trends, as Hardy, Beeton, and Pearson (2002) argued that sustainable tourism is still excessively focused on environmental and economic aspects in detriment of social factors. There are also some positive notes, as Butler (2010) pointed out that although "there are very few examples of a successful long term application of sustainable tourism principles at a destination level, [...] there are many examples of successful short term applications of sustainable development principles at a facility level" (p.12). In the end, the reality check supports higher expectations of success in small-scale short-term applications than in large- scale long-term applications of the sustainability principles. Nevertheless, while affirming the importance of the concept of sustainable tourism to respond to negative impacts of tourism and safeguarding a long-term viability, Liu (2003) has argued in favor of a systems perspective of the theme, consistent with the macro approach proposed by Wheeler (1991), and with the integration of economy, society, and environment proposed by Farrell (1999).

In a restricted environment, the disappearance of a single crucial resource might result in the collapse of an advanced society (Foot, 2004; Flenley, 1993). Restricted environments are more sensible to minor fluctuations of the available resources, and a marginally supportable population in one decade may become excessive in the following decade (MacIntyre, 1999).

In economies dominated by travel, tourism, and adjacent industries as MICE (meetings, incentives, conventions, and exhibitions), restricted environments are thought to: (1) be more fragile and vulnerable to the fluctuations of the demand and the evolution, mutation and rotation of markets; (2) support lower limits in carrying capacities and adapt less effectively to the impacts of high numbers of arrivals; and (3) operate under higher risks for the sustainability and the survival of organizations and the travel destination overall environment. In early stages of development, the increase of the population can be seen as a basic and pragmatic solution to respond to an increasing number of arrivals, but this solution is not a solution of efficiency and is especially dangerous the more restricted is the environment. Growing population and shrinking resources are a combination for collapse (Foot, 2004) in restricted or isolated environments, and the dangers of system overload and collapse may even be accentuated by slow, gradual changes and distorted perceptions of risk (Moreira 2009a, 2009b, 2008, 2007a, 2007b). Finally, the environmental systems overload should not be considered independent of the economic and social systems overload and, as Foot (2004) noted, the "environmental collapse can precipitate economic and social collapse" (p.12).

Restricted environments (Moreira, 2011a, 2011b, 2011c, 2010) face higher risks under conditions of travel and tourism market demand variation, overload of the carrying capacity, and resources scarcity. The development of specialized economies, especially in the stages characterized by rapid and powerful growth, can also enhance the competition between organizations for the access, control, and final share of the critical resources. The degree of change and transformation that has been imposed to the environment in the last millennium, and especially in the last century, is a stern reminder that the exceptional human potential for competition and destruction should never be neglected. Even when considering humans at the most basic animal level, “industrial humans are the most voracious predators in the world’s oceans and, simultaneously, the most successful terrestrial carnivore ever” (Rees, 2005, p.15).

A population collapse could be understood as a drastic decrease in the population size or complexity over a significant area and a prolonged time (Diamond, 2005) or, in our definition, a drastic decline in the population figures which stabilize far down from the highest levels reached in the past. Populations’ survival and development, in either human or organizational populations, depend on the equilibrium of primary resources. In organizational ecology, primary resources include survival, infrastructure and energy basics, physical space, access, human population to guarantee market and organizational members, and some degree of environment stability. These critical conditions are especially important in restricted environments due to the inherent fragilities of these systems, in which eccentric variations could initiate processes of economic decline and population collapse. Accordingly, this paper defends three fundamental ideas: (1) economic growth is not infinite or unlimited; (2) the sustainability of economic growth depends on the final state of sustainability of a destination; and (3) the intelligent use of resources and the monitoring of the natural limits are core elements of sustainable development in travel and tourism destinations. The following sections present three established scientific themes on survival and sustainability that will be later reanalyzed in view of the research empirical results.

The Extinction of the Dodo

The last confirmed sighting of the dodo in the Mauritius islands was reported by Everts in 1662 (there are also records of later captures of a dodo by Lamotius in 1668 and Hugo in 1673), and the extinction time was estimated statistically close to 1690 (Cheke, 1987, 2001, 2004; Turvey & Cheke, 2008; Fuller, 2002; Roberts & Solow, 2003; Hume, Martill & Dewdney, 2004).

The case of the dodo is still one of the most enigmatic cases of population extinction. One of the first species confirmed extinct, the dodo case is linked to the understanding of the extinction processes (Turvey & Cheke, 2008). In biology, it is now accepted that abrupt changes of the environment conditions can represent a risk of extinction if the populations are unable to adapt or relocate to another geographic range (Chevin & Lande, 2009).

The extinction of the dodo is the result of a combination of factors. The most important of these factors are perhaps related to the benevolent conditions of the environment that allowed dysfunctionalities to accumulate over time in the absence of evolutionary pressures, and the impossibility of relocation due to the restrictions and isolation of the environment.

One of the characteristics of the environment that is relevant to establish parallels with the field of organizational ecology is the evidence that the environment was restricted and isolated for a long time, and that the stability of the conditions was then disrupted with the entrance of new populations. It is true that the new populations included predators but, even without the direct threat the predators represent, if the environment is fundamentally restricted, new populations always have the negative effect of increasing the demand for resources, including geographic area.

Resource Degradation and Population Collapse at Easter Island

The environment degradation process on Easter Island was a gradual process (Zebrowski, 1997) and may have lasted for several human generations. The persistence of the error was extreme and the last tree went down most probably with the awareness that it was the final cut. As Flenley described it:

[...] it's a fairly small island. You could stand on the summit of Easter Island and see the whole place. The person who cut down the last tree must have known that it was the last [...] but they still cut it down. (As presented by Renouf, 2003)

Furthermore, as Bahn and Flenley (1992) stated:

The person who felled the last tree could see it was the last tree. But he (or she) still felled it. This is what is so worrying. Humankind's covetousness is so boundless. Its selfishness appears to be genetically inborn. Selfishness leads to survival. Altruism leads to death. The selfish gene wins [...]. (p. 214)

The orthodox view of the human origin of the Easter Island disaster has been contested (Rainbird, 2002; McCall, 1993; Orliac & Orliac, 1998; Haddon & Hornell, 1975; Van Tilburg, 1994; Langdon, 1995), but independently of the causes, the circumstance that an isolated restricted environment is more vulnerable to collapse seems consensual. According to Foot (2004):

On Easter Island the trees gradually become fewer, smaller and, as society adapted, maybe less important. The last palm disappeared around the mid-1400s, yet the real crisis did not appear until a century later by which time it was too late to do anything about the loss of the forest. (p. 17).

For Brander and Taylor (1998), "the economic record in Easter Island is one of rising wealth and rising population, followed by decline" (p. 121). One of the explanations to the Easter Island human population evolution is the degradation of a slow-growth resource base due to population growth and the consequent population decline. The specific palm tree that existed in Easter Island (*Jubaea chilensis*, the Chilean wine palm) is a very slow-growing palm taking 40 to 60 years to reach the fruit-growing stage, which along with the unfavorable rainfall and temperature are the initial conditions contributing to the decline of the resource (Brander & Taylor, 1998). A hypothesis considered is that, with a faster-growing resource base, the population and the resource stock may have converged to a stable equilibrium over time (Brander & Taylor, 1998).

Two questions noted by Rainbird (2002) have special relevance to economic competition and development: (1) Is landscape change a natural or a cultural product? (2) Is the landscape change a degradation of the environment or an enhancement? When analyzing phases of extreme development in restricted environments as travel and tourism destinations, the same questions emerge related to economic, social, and environment stability and sustainability.

The Tragedy of the Commons Effect

The tragedy of the commons effect is the rational drive to deplete indefinitely finite resources pursuing individual utility (Hardin, 1968, 1998). When the maximum sustainable population is reached or the decision and behavioral patterns are non-sustainable, the collapse of population, economy, and society is inevitable (Foot, 2004). Barnett and Adger (2007) have argued on the security consequences of climate change affecting and reducing the access and the quality of vital natural resources, through “the prospect of conflict stimulated by changes in social systems driven by actual or perceived climate impacts” (p. 640). Homer-Dixon (1993, 1994) presented evidence from several cases linking environmental scarcities and violent conflict, and identified three principal sources of human-induced scarcity: (1) reduction of the quantity or quality of renewable resources; (2) population growth; and (3) resource distribution anomalies and concentration of resources.

The Malthus law of population asserts that population growth is limited by the means of subsistence (Malthus, 1993; Barrows, 2010; Brander, 2007). Referring to an analysis by Brander and Taylor (1998) on the history of Easter Island using the Malthusian model, Brander (2007) stated “recent work has shown formally that Malthusian demographics in the presence of renewable resources can give rise to cycles in living standards and population” (p. 4). Brander (2007) further explained that “the Malthusian cycle of abundance and privation, leading to population expansions and declines, is a fundamental aspect of human history” (p. 5), and that “the most fundamental sustainability factor is demography, as originally identified by Malthus in 1798 (p. 36).

The primary forces in the fluctuation of populations’ numbers are the natality or the birth rate, the mortality or the death rate, and the migration or the location transference of individuals in the population. The environmental factors are considered secondary factors, which influence is reflected in the fluctuations of the primary factors (Pearl, 1927). There is however evidence that both the primary and the secondary factors affect the human populations and the populations of organizations. Archaeological and anthropological evidence has been revealing a consistent pattern of economic and population growth, resource degradation, and subsequent economic decline (Brander & Taylor, 1998). Resource degradation is understood as a common force of decline in major civilizations of the past (e.g. Mayan; Anasazi; and Akkadian, Babylonian, and Sumerian in ancient Mesopotamia) and modern population collapses (e.g. Rwanda after 1950), with a major influence from population growth, human activity, and endogenous resource degradation at times combined with exogenous climate fluctuations or other environmental changes (Brander & Taylor, 1998).

Applying the theoretical framework to populations of organizations, parallels are found in Lenox, Rockart, and Lewin (2007) with the discussion of the evolution of an industry or a population of organizations through the concept of shakeout:

[...] a rise and fall in the number of competitors over time. Following the inception of an industry, new entrants rush in, often driving up the rate of innovation and leading to a diverse set of ways to deliver value. Competition intensifies and industry exit increases. Over time the rate of entry decreases, eventually stabilizing at a low level. As a result, the number of firms within the industry grows exponentially at first, then peaks, and then declines, typically settling in with a few dominant firms. (p. 599)

On a final note and consistent with the destination life cycle model (Butler, 1980, 2010), one of the conclusions of Gort and Keppler (1982) suggested that in new industries at some stage the number of organizations will significantly decline.

If there is a resource limit and this limit is an invariable limit, the natural behavior tendency is competition. The competition level will tend to rise as the resource levels decrease, ending in scarcity as a result of lower total levels of finite resources and insufficient recovery time for renewable resources, population growth, and resource distribution fluctuations resulting from access control or resource concentration.

The following sections will present the experimental methodology details of a research decision game and the data collected in the first experimental trials. These results are expected to contribute to the understanding, at a fundamental level, of the strong tendency to competition that might be responsible for some of the efficiency deficits of human and organizational populations, and for some of the risks of decline and collapse discussed.

Methodology

The first data series collection including these 52 trials of the decision game took place in Macau SAR, PR China, between 2006 and 2011. The composition of the teams playing the game varied from 2 to 6 team members, and all the subjects were at the time first year college students in management majors. The decision game used in the research methodology is a basic competition versus cooperation game. The objective of the game was stated as follows: Each team should try to win the biggest amount of money possible (no real money is involved, the amounts are reflected by the scores). The game had the following rules:

- The game is played in ten moments, by two teams at a time. In three of the moments negotiations will be held between the teams' delegates. These moments are the 3rd, the 5th, and the 8th play. Besides these three moments there is no communication between the teams during the game.
- The teams are free to choose the team leader and the negotiators.
- Each play consists on a simple decision, between red and black.
- After both teams finished writing the decision on a paper, the decisions are announced and the scores are written on a whiteboard, including the scores for each play and the cumulative scores. The information in the whiteboard is always accessible to both teams during the game.

- Scores: If team A chooses black and team B chooses red, team A loses 10 (scored as -10) and team B wins 140. If team A chooses red and team B chooses black, team A wins 140 and team B loses 10 (scored as -10). If both teams choose black, both teams win 100 each. If both teams choose red, both teams score 0 each.

Resulting from the game competition versus cooperation decision options, the possible final results of the interaction between the two sides are of four types. Competition processes origin three of these, or 75 percent of all the expected results (win-lose, lose-win, and lose-lose) while cooperation generates only one, or 25 percent of all the expected results (win-win). Yet, a cooperation result is beneficial for both sides, strengthens the likelihood of positive future interactions, and tends to extend all the gains closer to the possible limit, increasing the total generated by the game. The a priori likelihood of cooperation versus competition is however of only one to three. Besides that, to achieve a cooperation result both sides have to decide to cooperate, while if one of the sides decides to compete there is no other acceptable option to the other side to stop losses but to engage in competition.

Results and Data Analysis

In this set of results, each time the game was played or, in other words, each time an opportunity was presented, the average total generated by the game was 755 out of the possible limit of 2000. This means that, due to the competition tendency, each time the game was played there was an average loss of 62% or a generated gain of only 38% compared to the reference limit, what hardly can be understood as an efficient use of the opportunity. The reference limit of 2000 is the maximum limit of added scores originated by the game, and is the result of ten iterations of black-black, with each team scoring 1000 at the end. The maximum possible limit for one team corresponds to ten iterations of red-black, with the team playing red scoring 1400. The team playing ten iterations of red would score -100. This is however a technical limit as no team will continue to play black and loosing while the other team continues to play red and winning. This never happened in all the 52 trials. In case of extreme competition, the most likely response observed was a behavioral change in the team that was playing black. The team playing black also started to play red to stop losses, and then both teams stopped scoring as the red-red combination corresponds to a 0 score for each team.

The results presented in Table 1 show that the means of the lower and higher final scores are distant from the maximums recorded and from the game possible limits. The difference limit variable, calculated deducting the total generated by the game from 2000 (the best possible score), shows how far the mean is from the highest possible limit. The percentages calculated for the variables efficiency of the game ($(\text{total generated by the game}/2000) * 100$) and efficiency of the winner, calculated with reference to the competition win-lose limit score of the game [$(\text{higher final score}/1400) * 100$] show that on average more than 60 percent of the wealth that is possible to generate is lost due to the competition tendency.

Table 1. *Descriptive Statistics of the Final High and Low Scores, Total Generated by the Game, Efficiency of the Game, and Efficiency of the Winner*

	n	Mean	Minimum	Maximum	SD
Lower final score	52	299	0	900	178
Higher final score	52	455	0	1100	278
Score difference	52	156	0	750	201
Total generated by the game	52	755	0	1800	421
Difference limit	52	1245	200	2000	421
Efficiency of the game	52	38	0	90	21
Efficiency of the winner	52	30	0	79	20

Considering the overall interest of the paper in the discussion of the limit extrapolation of the dominant behavioral tendency to the sustainability and economic survival endurance of travel destinations, the efficiency of the game is the most important result, as this is the game indicator that in a limit extrapolation would correspond to the destination economy efficiency.

To investigate the effects of the level of competition on the final indicators (total generated by the game, efficiency of the game, efficiency of the winner) a t-test analysis for independent samples was performed. The independent samples (high competition, low competition) were differentiated by the frequency of the competitive totals. The high or low competition trials were defined by the frequencies of the black-black results, as all the other possibilities (red-black, black-red, red-red) involve competition. The high competition versus low competition reference threshold level 3 was chosen after the number of opportunities for communication and negotiation between the teams offered by the rules, under the assumption that without communication or negotiation the natural tendency is competition.

Table 2. *Total Generated by the Game, Efficiency of the Game, Efficiency of the Winner: High Competition Versus Low Competition*

	High Competition			Low Competition					
	n	Mean	SD	n	Mean	SD	t-value	df	p
Total generated by the game	40	581	284	12	1335	241	8.3	50	0.01
Efficiency of the game	40	29	14	12	66	13	8.0	50	0.01
Efficiency of the winner	40	23	14	12	56	16	6.8	50	0.01

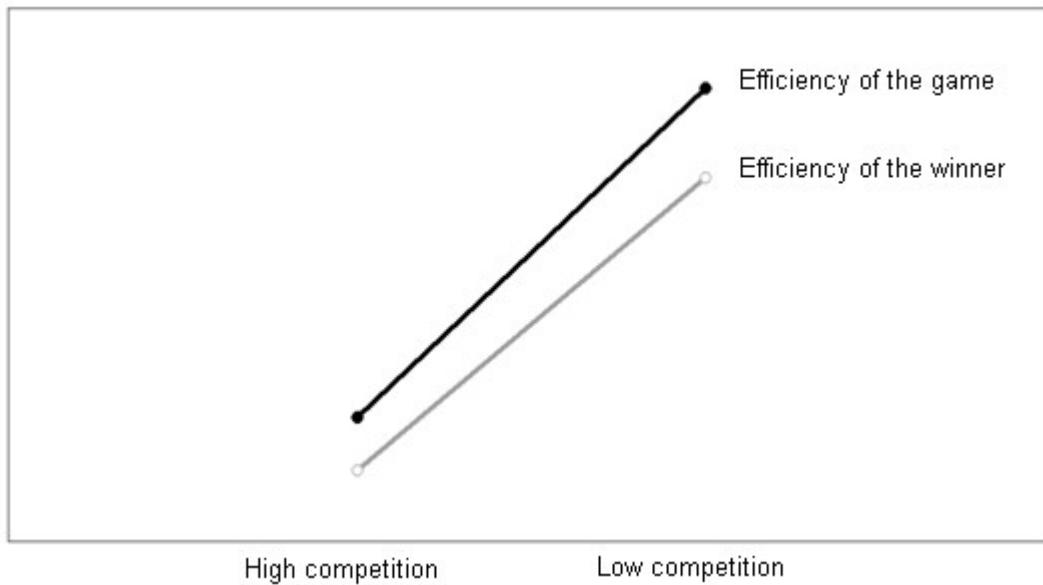


Figure 1. Efficiency of the game and efficiency of the winner means comparison: High Competition versus Low Competition.

The high competition sample included the trials with high competition results (cooperation <3 iterations of black-black out of 10 plays, n=40). The low competition sample included the trials with low competition results (cooperation ≥ 3 iterations of black-black out of 10 plays, n=12). The high competition trials were far more frequent than the low competition or cooperation trials, with the final numbers even higher than the earlier discussed expected ratio of 75 percent high competition versus 25 percent low competition (high competition trials 77 percent, n=40; low competition trials 23 percent, n=12). Limit competition (10 iterations of red-red, total generated by the game=0) was found in 2 trials, or 4% of the total. The total absence of competition, corresponding to limit cooperation (10 iterations of black-black, total generated by the game=2000) was not found.

The differences between the groups means were significant for all the performance variables for a $p < .01$. The detailed statistics are the following: (1) total generated by the game $t(50,1)=8.3$, $p < .01$; (2) efficiency of the winner $t(50,1)=6.8$, $p < .01$; and (3) efficiency of the game $t(50,1)=8.0$, $p < .01$ (Table 2, Figure 1).

The results clearly indicate that, with reference to the game potential there is a major loss of efficiency caused by competition, and that, when the high and low competition trials were compared, the total generated by the game, the efficiency of the game, and the efficiency of the winner were all significantly lower in the high competition trials than on the low competition trials.

Discussion

The study outlines some of the questions that can be raised on the sustainability theme. The cases and the results presented are only a fraction of the arguments for the importance of the study of sustainability and the implementation of preventive and corrective actions to delay or neutralize the decline of destinations. Each case can offer a simple conclusion, transposable to populations of individuals or populations of organizations operating in restricted economic environments.

The extinction of the Dodo case shows that, in restricted environments with protective conditions stable for a long time, some populations develop a very strong adaptation to the conditions, but the progressive consolidation of the adaptive mutations is characterized by a high vulnerability in changes of the environment conditions, especially rapid and radical changes, which represent severe risks of decline, collapse, and extinction.

The Easter Island case shows evidence that the decisions and the behaviors in the present may determine the evolution, development, and decline or collapse of populations in the future. There are decisions and behaviors that cause permanent damage and can never be corrected. Even if the decisions and behavior effects are only to emerge far in the future, sometimes with a delay of years or even generations, once some things are lost are lost forever and the more restricted and isolated the environment the more radical the direct and indirect repercussions on the whole environmental system.

The tragedy of the commons effect presents a model that explains the relation between the available resources of an environment and the population's full and uncoordinated control over the usage of these resources. The tragedy of the commons effect describes a situation complemented by the data from the trials of the decision game, showing that not only in theoretical but in empirical terms, competition is a far more likely decision and behavioral tendency than cooperation, and even when opportunities for communication and cooperation exist, only some of these opportunities will generate positive results for both sides.

The reduced number of experimental trials at this moment should be considered when reading the statistical analysis results. The study is still a preliminary study and more data is required to develop a clearer understanding of the competition component in the decision and behavioral trends. We should note that the special nature of events and business travel and tourism or MICE (meetings, incentives, conferences and exhibitions) encloses inherent optimal conditions for rapid and radical change, irrecoverable losses, and powerful effects on human and organizational populations, effects derived from the scale and the limit concentration in time and space of the events, and more dangerous in more vulnerable restricted and isolated environments. The protection of the sustainability of destination systems should be considered a first priority as it provides the infrastructural conditions without which stable long term economic development will inevitably collapse. Such events should be seriously considered, justifying careful and anticipated planning in destination and event management applied fields, and the theoretical and research development of the theme to enable a deeper understanding of the risks and of the solutions that can be developed to defend economic long term sustainability without sacrificing irrecoverable destination assets.

Conclusions and Implications

The paper defends three fundamental ideas: (1) the economic growth and development of a travel destination should not be considered infinite or unlimited; (2) the sustainability of the economic growth depends on the final state of sustainability of a travel destination; and (3) the intelligent use of resources and the monitoring of the natural limits are core elements of the management of sustainable development in travel destinations. These three ideas become even more critical in restricted environments, characterized by additional vulnerability to collapses. The dominant competition tendency identified in the research results may represent in the limit an internal threat to the equilibrium, sustainability, and economic survival endurance of a travel destination, and destination management institutions should be aware of the risks of nonstop expansion strategies and of the fact that some damages in the development process will be irreversible. Sensitive monitoring, scenarios anticipation, intelligent planning, and responsible prevention would be strongly advised in such cases.

Finally, some limitations of the study should be considered, namely the size and characteristics of the sample and the use of a single version of the decision game. In future research it is suggested that additional versions of the game are created and the study is carried out in bigger samples and samples with different characteristics.

References

Bahn, P., & Flenley, J. (1992). *Easter Island, Earth Island*. London: Thames and Hudson.

Barrows, S. (2010). The Law of Population and the Austrian School: How Austrian economists interacted with Thomas Robert Malthus. *American Journal of Economics and Sociology*, 69(4), 1178-1205. <http://dx.doi.org/10.1111/j.1536-7150.2010.00740.x>

Barnett, J., & Adger, W. N. (2007). Climate change, human security and violent conflict. *Political Geography*, 26(6), 639-655. <http://dx.doi.org/10.1016/j.polgeo.2007.03.003>

Brander, J. (2007). Viewpoint: Sustainability: Malthus revisited. *Canadian Journal of Economics*, 40(1), 1-38. <http://dx.doi.org/10.1111/j.1365-2966.2007.00398.x>

Brander, J., & Taylor, S. (1998). The simple economics of Easter Island: A Ricardo-Malthus model of renewable resource use. *American Economic Review*, 88(1), 119-138.

Butler, R. (2010). Sustainability or stagnation? Limits on development in tourism destinations. *European Journal of Tourism, Hospitality and Recreation*, 1(1), 10-23. <http://dx.doi.org/10.1111/j.1541-0064.1980.tb00970.x>

Butler, R. (1980). The concept of a tourist area cycle of evolution: Implications for management of resources. *Canadian Geographer*, 24(1), 5-12.

Cheke, A. S. (2004). The dodo's last island: Where did Volkert Everts meet the last wild dodos? *Proceedings of the Royal Society of Arts and Sciences of Mauritius*, 7, 7-22.

Cheke, A. (2001). Is the bird a Dodo? The wildlife of a mid- seventeenth century drawing of Dutch Mauritius. *Archives of Natural History*, 28(3), 347-351. <http://dx.doi.org/10.3366/anh.2001.28.3.347>

Cheke, A. (1987). An ecological history of the Mascarene Islands with particular reference to extinctions and introductions of land vertebrates. In A. W. Diamond (Ed.), *Studies of Mascarene Island birds*. Cambridge: Cambridge University Press, 5-89.

Chevin, L. M., & Lande, R. (2010). When do adaptive plasticity and genetic evolution prevent extinction of a density-regulated population? *Evolution*, 64(4), 1143-1150. <http://dx.doi.org/10.1111/j.1558-5646.2009.00875.x>

Clarke, J. (1997). A framework of approaches to sustainable tourism. *Journal of Sustainable Tourism*, 5(3), 224-233. <http://dx.doi.org/10.1080/09669589708667287>

Diamond, J. (2005). *Collapse: How societies choose to fail or succeed*. New York: Viking Press.

Farrel, A. (1999). Sustainability and decision-making: The EPA's sustainable development challenge grant program. *Policy Studies Review*, 16(3/4), 36-74. <http://dx.doi.org/10.1111/j.1541-1338.1999.tb00878.x>

Flenley, J. (1993). The Palaeoecology of Easter Island and its ecological disaster. In S. Fischer (Ed.), *Easter Island studies: Contributions to the history of Rapanui in memory of William T. Mulloy* (Oxbow Monograph 32) (pp. 27-45). Oxford, UK: Oxbow Books.

Foot, D. K. (2004). Easter Island: A case in non-sustainability. *Greener Management International*, 2004(48), 11-20. <http://dx.doi.org/10.9774/GLEAF.3062.2004.wi.00004>

Fuller, E. (2002). *Dodo: A brief history*. New York: Universe Publishing.

Gort, M., & Klepper, S. (1982). Time paths in the diffusion of product innovations. *Economic Journal*, 92(367), 630-653. <http://dx.doi.org/10.2307/2232554>

Haddon, A. C., & Hornell, J. (1975). *Canoes of Oceania* (Bernice P. Bishop Museum Special Publications 27-29). Honolulu, HI: Bishop Museum Press.

Hardin, G. (1998). Extensions of "The Tragedy of the Commons". *Science*, 280(5364), 682-683. <http://dx.doi.org/10.1126/science.280.5364.682>

Hardin, G. (1968). The tragedy of the commons. *Science*, 162(3859), 1243-1248. <http://dx.doi.org/10.1126/science.162.3859.1243>

Hardy, A., Beeton, R., & Pearson, L. (2002). Sustainable tourism: An overview of the concept and its position in relation to conceptualizations of tourism. *Journal of Sustainable Tourism*, 10(6), 475-496. <http://dx.doi.org/10.1080/09669580208667183>

Homer-Dixon, T. F. (1994). Environmental scarcities and violent conflict: Evidence from cases. *International Security*, 19(1), 5-40. <http://dx.doi.org/10.2307/2539147>

Homer-Dixon, T. F. (1993). *Environmental scarcity and global security*. New York, NY: Foreign Policy Association.

Hugo, H. (1674). Letter [Hubert Hugo writing to the Cape Commander]. Archive of the Political Council (C293). Cape Archive, South Africa.

Hume, J. P., Martilli, D. M. & Dewdney, C. (2004). Palaeobiology: Dutch diaries and the demise of the dodo. *Nature*, 429(6992), 622. <http://dx.doi.org/10.1038/nature02688>

Lamotius, I. J. J. (1685-1688). Dag-register van't principale gepasseerde op't Eyland Mauritius gehou'den byj opperhoof Isaac Joan Lamotius gebinnende mit den 1st January 1685-1688 [Excerpts from Lamotius journals]. Archive of the Political Council (C2238, C2239, C2240). Cape Archive, South Africa.

Langdon, R. (1995). New light on Easter Island prehistory in a 'censored' Spanish report of 1770. *Journal of Pacific History*, 30(1), 112-120. <http://dx.doi.org/10.1080/00223349508572787>

Lenox, M. J., Rockart, S. F., & Lewin, A. Y. (2007). Interdependency, competition, and industry dynamics. *Management Science*, 53(4), 599-615. <http://dx.doi.org/10.1287/mnsc.1060.0679>

Liu, Z. (2003). Sustainable tourism development: A critique. *Journal of Sustainable Tourism*, 11(6), 459-475. <http://dx.doi.org/10.1080/09669580308667216>

MacIntyre, F. (1999). Is humanity suicidal? Are there clues from Rapa Nui? *Rapa Nui Journal*, 13(2), 35-41.

Malthus, T. (1993). *An essay on the principle of population*. Oxford: Oxford University Press. (Original work published 1798)

McCall, G. (1993). Little Ice Age: Some speculations for Rapa Nui. *Rapa Nui Journal*, 7(4), 65-70.

Moreira, P. (2011a, August). Organizational population density and clustering patterns of organizations in restricted economic environments: The recent evolution of the hotel population in Macau SAR, PR CHINA. In *Proceedings from the Shanghai International Conference on Social Science*. Shanghai, PR China: Higher Education Forum.

Moreira, P. (2011b, July). The effects of competition in restricted economic environments on the density and clustering patterns of populations of organizations: The cases of the hotel populations in Niagara Falls, New York, USA and Ontario, Canada, and Macau SAR, PR China. In *Proceedings from the 10th Asia Pacific Forum: Emerging Tourism and Hospitality Trends*, International Conference. Singapore: University of Nevada Las Vegas Singapore (UNLV Singapore).

Moreira, P. (2011c, July). The perception of the underlying equilibrium between rapid economic growth and environment sustainability: A study on primary city indicators. In *Proceedings from the 1st International Conference on Tourism and Technology*. New Delhi, India: Indian Institute of Technology Delhi (IIT Delhi).

Moreira, P. (2010, November/December). On the perception of the impacts of economic growth and travel and tourism development. In *Proceedings from the International Conference 4th Tourism Outlook and ITSA 2010*. Kuala Lumpur, Malaysia: Mara University of Technology (UiTM), Malaysia & International Tourism Studies Association (ITSA).

Moreira, P. (2009a). *Mental frames and human decisions: Determinants of stable and unstable patterns of decision*. Beau-Bassin, Mauritius: VDM Verlag.

Moreira, P. (2009b, February). Economic change, prices and the adherence effect: information, rationality and human decisions. In J. Carlsen, M. Hughes, K. Holmes, & R. Jone (Eds.), *Proceedings from the Council for Australian University Tourism and Hospitality Education (CAUTHE) Conference 2009: See change: Tourism and hospitality in a dynamic world*. Perth, Australia: Curtin University of Technology.

Moreira, P. (2008, December). Xtreme competition: The next trend in the evolution of tourism in Asia Pacific. In J. Fountain, & K. Moore (Eds.), *Proceedings from the New Zealand Tourism and Hospitality Conference 2008*. Christchurch, New Zealand: Lincoln University.

Moreira, P. (2007a). Stealth risks and catastrophic risks: On risk perception and crisis recovery strategies. In N. Scott, B. Prideaux, & E. Laws (Eds.), *Journal of Travel and Tourism Marketing* (Special Issue on Tourism Crisis and Marketing Recovery Strategies), 23(2/4), 15-28.

Moreira, P. (2007b). Aftermath of crises and disasters: Notes for an impact assessment approach. In E. Laws, B. Prideaux, & K. Chon (Eds.), *Crisis Management in Tourism* (pp. 51-65). Oxford, UK: CAB International. <http://dx.doi.org/10.1079/9781845930479.0051>

Orliac, C., & Orliac, M. (1998). The disappearance of Easter Island's forest: Over-exploitation or climatic catastrophe? In C. Stevenson, G. Lee, & F. Morin (Eds.), *Easter Island in Pacific context: South Seas Symposium: Proceedings of the Fourth International Conference on Easter Island and East Polynesia* (p.129-134). Easter Island: Easter Island Foundation.

Pearl, R. (1927). The growth of populations. *Quarterly Review of Biology*, 2(4), 532-548. <http://dx.doi.org/10.1086/394288>

Rainbird, P. (2002). A message or our future? The Rapa Nui (Easter Island) ecodisaster and Pacific Island environments. *World Archaeology*, 33(3), 436-451. <http://dx.doi.org/10.1080/00438240120107468>

Rees, W. (2005). Contemplating the abyss: The role of environmental degradation in the collapse of human societies. *Nature*, 433, 15-16. <http://dx.doi.org/10.1038/433015a>

Renouf, J. (Writer, Director, Producer). (2003). The mystery of Easter Island [Television series episode; transcript]. In M. Barrett (Executive Producer), *Horizon*. London, UK: BBC. Retrieved from <http://www.bbc.co.uk>

Roberts, D., & Solow, A. (2003). Flightless birds: When did the dodo become extinct? *Nature*, 426(6964), 245. <http://dx.doi.org/10.1038/426245a>

Turvey, S., & Cheke, A. (2008). Dead as a dodo: The fortuitous rise to fame of an extinction icon. *Historical Biology*, 20(2), 149-163. <http://dx.doi.org/10.1080/08912960802376199>

Van Tilburg, J. (1994). *Easter Island: Archaeology, ecology and culture*. London, UK: British Museum Press.

Wheeler, B. (1991). Tourism's troubled times: Responsible tourism is not the answer. *Tourism Management*, 12(2), 91-96. [http://dx.doi.org/10.1016/0261-5177\(91\)90062-X](http://dx.doi.org/10.1016/0261-5177(91)90062-X)

Williams, J. (1992). How sustainable is your competitive advantage? *California Management Review*, 34(3), 29-51. <http://dx.doi.org/10.2307/41167422>

Zebrowsky, E. (1997). *Perils of a restless planet: Scientific perspectives on natural disasters*. Cambridge, UK: Cambridge University Press.